

The Estimation of Urea by means of Hypobromite

ALLOW me to correct a slight mistake into which your reporter has fallen, no doubt inadvertently.

Knop was the first to propose (in 1870) the use of a strongly alkaline solution of hypobromite for the estimation of urea in place of the hypochlorite previously employed by Davy. Every chemist who since 1870 has worked with the process has, as far as I am aware, retained the exact composition of Knop's hypobromite solution.

The modifications in details which I have proposed are therefore for the purpose of facilitating the working of Knop's process. This process is, I believe, the one best suited for general use. Certainly no other process as yet devised equals it in rapidity and ease of working, and few, if any, surpass it in accuracy. If, then, it should be deemed desirable to attach any names to this process, I would suggest that it be called the Knop-Davy process.

A. DUPRÉ

Westminster Hospital, February 24

Colœnis Julia in Texas.—Venomous Snakes devouring each other

IN Chapter xv. of his "Geographical Distribution of Animals," Mr. Wallace mentions *Colœnis* (belonging to the Nymphalidae) as one of the South American forms, which do not pass north of Costa Rica or Nicaragua. I have taken, though only once during nine years, a female of *Colœnis julia*, Hübner, here at Bastrop, on the Colorado, in about 30° N. latitude, but I believe this to be the first time where said species has been captured in temperate America.

I do not know whether the fact has been observed before, that one venomous snake will devour another belonging to even the same genus. Some time ago I captured, on the Guadaloupe River, a large and very thick *Ancistrodon pugnax* (Water Moccasin), one of the Crotalidae, and upon opening it, found inside a large and quite well preserved specimen of *Ancistrodon contortrix* (Copperhead).

Although I have examined many venomous snakes since, I never found a similar case, and the stomachs contained only mice, frogs, &c.

L. HEILIGBRODT

Bastrop, Texas, February 7

Lowest Temperature

THE temperature experienced during the night between February 28 and March 1 was so exceptional, that it may be thought worthy of a passing remark. The minimum reading at this observatory was 9.1° F., which is the lowest recorded during the last sixteen years; that of December 24, 1860, was, however, lower, being 6.7°. The lowest readings for February and March during the past twenty-eight years were respectively 10.1° on February 1, 1855, and 14.5° on March 4, 1866.

Stonyhurst Observatory, March 2

S. J. PERRY

Meteor

I SAW the meteor described by Mr. Ingleby on February 26, about 6.20 P.M., Greenwich, from the railway platform at Gloucester. It was moving very slowly from right to left parallel with the horizon to the right of the moon, and a good deal below her; I should think two or three degrees at least. A bright track was left behind. The size must have been considerable for it was a very brilliant evening, and still almost daylight. No stars were visible in that part of the sky. I could not then see the position of Sirius, however. It was tolerably bright twenty minutes later. Gloucester is nearly due west of Ilford, and about 100 miles distant in a straight line.

Westbury-on-Severn, March 3

ALBERT J. MOTT

REPORT ON THE GOVERNMENT METEOROLOGICAL GRANT

THE following is the Report to the Lords Commissioners of her Majesty's Treasury by the Committee appointed in November, 1875, to inquire into the conditions and mode of administration of the annual grant of 10,000*l.* in aid of meteorological observations. That Committee consisted of the following:—Sir W. Stirling Maxwell, Chairman, Mr. T. Brassey, Mr. T. H. Farrer, Mr. Francis Galton, Mr. David Milne Home, Dr. J. D. Hooker, Mr. R. R. W. Lingens, C.B., and Lieut.-Gen.

Rd. Strachey. We hope to make a few comments on the Report in our next number.

1. We have, in accordance with the Treasury Minute of November 2, 1875, made the inquiries therein mentioned. In doing so we have asked for the opinion of the President and Council of the Royal Society, who have favoured us with an elaborate report. We have also taken evidence from members and officers of the Committee which has hitherto administered the grant; and from many other persons whose opinions appeared to us to be important, either on account of their scientific eminence, their official position, or their practical knowledge and experience of the subjects in respect of which, and the classes to whom, meteorological knowledge is specially useful. To this report and evidence, which are contained in the Appendix to our Report, we desire to refer in support of the following conclusions:—

2. The business of the Committee may be considered under two heads, viz.:—

(1) The Meteorology of the Ocean.

(2) The Meteorology of the British Isles.

And the business relating to the latter of these may again be subdivided as follows, viz.:—

(a) That branch which by the use of the telegraph collects material for, and issues daily weather charts and storm warnings.

(b) That branch which collects, digests, and publishes meteorological statistics. This last branch depends on two sources of information; viz. (1) on observations taken at a limited number of stations which are provided with self-recording instruments, and which furnish continuous observations; and (2) on observations taken by the eye at stated daily periods at more numerous intermediate stations.

3. All these divisions and sub-divisions of the business have produced results of value, and should be continued. For more specific information on these points we beg to refer to the evidence, and especially to the report of the President and Council of the Royal Society.

4. Ocean meteorology should, we think, be transferred to the Hydrographical Department of the Admiralty. The reasons for this are, first, that whilst this department is equally able with the present Committee to collect observations from merchant ships, it must be better able to collect similar observations from her Majesty's ships; and, secondly, that from its experience in chartography and in nautical wants, it is specially competent to put the results in a form useful to navigators.

5. In performing this new duty the Hydrographical Department should be in such relation with the office or department which manages land meteorology, as to insure that the observations taken at sea will be so made and digested as to be available for scientific purposes in connection with those made on land.

6. Every effort should be made to act in concert with other nations in ocean meteorology, so that labour may be economised, and the utmost possible use be made of all available materials.

7. In recommending the above transfer we assume that the Lords of the Admiralty will be willing that the Hydrographical Department should undertake the duty; that that department will be organised and made in all respects adequate for the purpose; that the observations from merchant ships which have been hitherto successfully collected by the present Committee, and which are necessarily more numerous and more varied than any which can be obtained from the Royal Navy, will continue to be collected; and that the advancement of science, so far as the ocean is concerned, will be no less an object with the Hydrographical Department of the Admiralty than it has hitherto been with the present Committee.

8. As to land meteorology we have considered the alternative proposals of appointing one permanent head, as was the case before 1866, and of leaving matters to be managed by a Committee in the same manner in which they have since been managed. But we cannot recommend either of these proposals. As regards the first, although it may be desirable at some future time to create a permanent meteorological establishment on some such footing as that of the Astronomical Observatory at Greenwich, with an officer of scientific eminence at its head, we think that matters are scarcely ripe for such a step at present. As regards the second, it cannot be expected that the gentlemen who now constitute the Meteorological Committee, and who have by way of experiment given much valuable time to the work in its

initial stages, will continue to do so under the existing conditions.

9. We think, however, that the Royal Society should be invited to continue to recommend to the Government persons eminent in science to superintend the work, under the title of a Meteorological Council. They should be appointed for limited periods and should be eligible for re-appointment. They should be fewer in number than the present Committee, and the means should be provided of remunerating them in the shape of fees for attendance. They should have and exercise complete control and supervision over and be responsible for the business, expenditure, and staff, the chief officer of which would be more appropriately designated by the title of secretary than by his present title of director. The important duty of selecting a chairman, would rest with the Royal Society or with the members of the Council.

10. The present system of collecting daily information by telegraph and of issuing storm-warnings should continue. There is evidence that it is of real value to the seafaring population, and that it leads them to thought and observation on the subject of weather. The want of communication by telegraph on Sundays causes a serious defect in the system, which ought to be remedied.

11. An endeavour should be made to put into clear shape, and to issue, for public information, the maxims or principles upon which storm-warnings are in future to be given. This information should be revised from time to time so as to embody the latest results of experience.

12. The process of issuing daily weather-charts, with explanations, should continue, with such improvements as experience may from time to time suggest. The information thus given not only creates a general interest in the subject, but is of value to persons who are disposed to engage in the discussion of scientific meteorological problems.

13. A certain number of continuously self-recording stations should be retained. But it may deserve consideration by the Council whether some at any rate of the existing stations may not be discontinued, and others obtained on more eligible sites. Doubts have also been expressed whether in the present state of meteorological science the minute exactness of the observations now taken at these stations is of sufficient comparative value to justify the whole of the costs which they involve, when there are so many other objects of meteorological inquiry which call for increased expenditure.

14. The present system of supplementing self-recording observations by returns from eye-observers at intermediate stations should be continued. The positions of these latter stations should, however, be revised, and their number increased, especially in Ireland (where at present there are but few of them); so that the returns may exhibit a fair representation of the different climates and weather of the British Isles. Every possible endeavour should be made to secure the co-operation and assist the efforts of the different societies or other local bodies engaged in meteorology, and to further the adoption of uniform methods.

15. The evidence of the Astronomer-Royal and of other scientific witnesses contains some important observations on the form and extent in and to which the results of the observations should be published. This is a subject which deserves the careful attention of the Council with a view to saving all unnecessary expense on the one hand, and on the other to publishing the results in such a form as may render them most available for use by men of science.

16. There is evidence to show that the system adopted in the United States by which observations are taken over the large area of the North American continent and are communicated by telegraph to Washington, is of great value both for the immediate practical purposes of agriculture and navigation, and also as throwing light on the general movement of the atmosphere. The position and extent of the United Kingdom do not admit of any similar system of equal value. But it is desirable in the general interests of science as well as for practical purposes, that by means of co-operation between the different European nations synchronous observations should be made throughout Europe and the adjacent seas, so as to afford all possible facilities for synoptic charts of the weather in Europe. To this end this country should give all the help it can.

17. There is important evidence that the science of meteorology at the present moment stands in need of hypothesis and discussion at least as much as, if not more than, of observation. It is not easy to lay down any rule concerning the method by

which such investigations may be promoted. But we think that the Council should be at liberty to appropriate a part of their annual grant to the purposes of any special researches which they may think important, and in such cases it should rest with them to select the investigators, and fix the remuneration.

18. There is evidence of a connection between weather and health; but it does not appear that any special meteorological observations are wanted at present, or are likely to be wanted in future for this special purpose, other than the observations, which, under the scheme we have recommended, the Council should collect for general purposes.

19. Again, the importance of meteorological data to the agriculturist and dealer in agricultural produce is clearly established. But neither do their requirements demand other observations than should be included in the general returns and information obtained by the Meteorological Council.

20. As regards the forms in which the information thus collected can be made most available for sanitary and agricultural purposes, it appears desirable that the Meteorological Council should place themselves from time to time in communication with the Registrars General, and with such bodies as the Medical Council, and the Agricultural Societies of the United Kingdom.

21. The expense of the scheme we have suggested may be estimated as follows:—

The following return has been prepared by members of our Committee who are also members of the Meteorological Committee of the approximate present cost of the Meteorological Office:—

Director's office and general control	2,500
Ocean meteorology, excluding supply of instruments	1,500
Land meteorology including self-recording observations and supply of instruments	3,500
Telegraphy and storm-warnings	2,500
Total	£10,000

The modifications that have been proposed would lead to certain additions to the necessary outlay, among which may be specified—

Remuneration of Council, say	1,000
Special scientific researches	1,000
Extension of telegraphy on Sundays	500
New land stations	1,500
Inspection of stations	500

Total	£4,500
Deduct for ocean meteorology transferred to Admiralty	1,500

Net increase ... £3,000

This sum being added to the present grant of 10,000*l.* would bring the whole sum to be placed at the disposal of the Council up to 13,000*l.* yearly. Assuming the expense of ocean meteorology transferred to the Admiralty to remain under the new arrangement at its old figure, 1,500*l.*, the whole additional annual burden on the National Exchequer proposed in the above suggestions is 4,500*l.* or 14,500*l.*, instead of the existing grant of 10,000*l.*

22. With reference to the Scottish Meteorological Society, the representations of which have been specially referred for our consideration, we desire to offer the following remarks:—

It seems essential that any grant of public money for the purposes that have been indicated in our recommendations, should be applied under the immediate responsibility of the Council, and that no expenditure should be incurred which those purposes do not absolutely require. There is evidence to show that a large and trustworthy amount of co-operation may be obtained in all parts of the United Kingdom, from observers who do not require remuneration for their service, and it seems very important that such co-operation should be fostered to the utmost. Any system of payment for meteorological registers which was not very strictly limited, would necessarily involve the concession of payments to all observers, and might entail a very large outlay which has hitherto been avoided, and which there is reason to believe is not at present really called for.

We are of opinion, therefore, that only such payments should be made from the grant placed at the disposal of the Meteorological Council as are necessary for the purposes of the scheme.

¹ See paragraph 25 of this Report.

logical Council to the Scottish Meteorological Society, as are necessary for obtaining observations at stations required for the purposes of the Council; for securing the proper inspection of stations the registers from which are required for the general purposes of the Council; for the needful compilation and check of such registers; and for meeting other charges directly arising from these services; or for special researches conducted by the Society with the approval of the Council; but that no grants should be made to ordinary observers, nor for any general purposes of the society which lie beyond the scope of the operations to be placed under the Council.

23. We think that the same principle should be applied to all similar local bodies interested in the study of Meteorology; so that, in fact, no payments should be made to them except for results sought for by the Council.

24. We have indicated above in very general terms the functions of the proposed Council, and we do not think it desirable to fetter their discretion by further details. We append, however, to this report a paper by a member of the present Committee of the Royal Society, who is also a member of our Committee, stating what, according to present experience, are, in his opinion, likely to be their duties.

25. The later stages of the inquiry in relation to the transfer of oceanic meteorology to the Admiralty have raised some serious questions of expense, which the Government will, doubtless, require time to consider. We think it only just to the Committee which has heretofore had the administration of the annual grant to report our opinion that very good and valuable work is being done by it, and that if funds were provided to admit of the more responsible and more extended action of the Council, as suggested in paragraphs 9 and 22 of our Report, and if, at least provisionally, some assistance were given to the Scotch Meteorological Society, the more immediate objects referred to our Committee would be met, and there need be no interruption of the Committee's operations pending the delay, if any, which may occur, whilst the feasibility of transferring oceanic meteorology to the Admiralty is being maturely considered by her Majesty's Government.

It is important in connection with this part of the subject to bear in mind the strong claims which the Superintendent and other members of the existing staff have to continued employment.

26. In recommending the above changes we feel bound to express our sense of the great value of the disinterested services which, at the cost of much time and labour have been rendered during so many years by the Committee appointed by the Royal Society.

27. We are aware that what we are proposing is still tentative only, and we recommend, in conclusion, that there shall be a further inquiry and report at the end of (say) five years.

RESEARCHES ON THE SPECTRA OF METALLOIDS¹

THIS paper was published by Mr. Thalen after Mr. Angström's death. Mr. Thalen states, in the introduction, that only the first sheet was printed during Mr. Angström's life, who in the remainder would have liked to alter some passages and add others. Yet we take it that such alterations only would have referred to matters of detail, and that as far as the general conclusions are concerned the paper represents fairly Mr. Angström's opinion on the important questions discussed therein. Mr. Thalen has made the measurements, while the experiments were made by him in conjunction with Mr. Angström.

After a few historical remarks the authors give the following judgment on the question of double spectra:—

"We are far from denying that the lines of an incandescent gas may come out in greater number as the temperature, or perhaps only the quantity of radiating matter increases, or that some rays may increase much quicker than others in intensity. But it is certain that the assertion of various physicists that the lines originally seen may disappear altogether, and that in this way the spectrum may change completely in appearance is as unlikely from a theoretical point of view as it is contrary to experience. If such properties were real all spectroscopic researches would be rendered impossible as each element could play as far as its spectrum is concerned the parts of a Proteus.

"We do not deny that an elementary body may in certain cases give different spectra. The absorption spectrum of iodine, for instance, is quite different from its emission spectrum obtained by means of the electric spark. All bodies existing in different allotropic states will give different spectra corresponding to these different allotropic states provided that the allotropic states still exist at the temperature of incandescence.

"Oxygen, for instance, would present two different absorption spectra, one belonging to oxygen the other to ozone. But as ozone is destroyed at a high temperature, only one spectrum of incandescent oxygen can exist.

"Sulphur in the solid state exists in different allotropic states, and some observations lead us to believe that even as a gas it may exist in different states. Supposing this to be true, sulphur will give us several absorption spectra, while the possibility of a single or several emission spectra depends on the question whether the more complicated allotropic states support the temperature of incandescence.

"It is evident that the above cases do not form an exception to the general law which we have given, that an elementary body can only give one spectrum. In fact, if we suppose that the allotropic state is due to molecular constitution, it will possess from a spectroscopic point of view, all properties of a compound body, and in consequence it will be decomposed in the same manner by the disruptive discharge of electricity."

The paper then goes on to discuss the difference which is noticed in the electric spark, between the aureole and the spark itself. Messrs. Angström and Thalen sum up what they have said on the subject in the following words:—

1. There are two kinds of electric discharge, one of tension, which takes place by explosion, or disruptively, the other of quantity, which takes place by conduction, or continuously.

2. By the disruptive discharge which always takes place when the tension is sufficiently great, the body is, as a rule, torn into its smallest particles, and thus decomposed into its elements if the body is compound. The phenomenon of incandescence which accompanies both the mechanical disruption and chemical decomposition, cannot be considered as a consequence of the augmentation of temperature, but we ought rather to say that the high temperature is an effect of the mechanical and chemical force which disintegrated the body. In addition to the decomposition produced directly by the disruptive discharge, we may have chemical actions, which are, however, of a secondary nature.

3. When the electricity is conducted by conduction we must distinguish between two actions. We have actions which are entirely due to heat, and which belong to the conductors themselves. They increase with the square of the intensity of the current. We have, secondly, actions which make themselves perceptible at the surface of bodies, and which are proportional to the intensity of the current. These latter actions are confined in elementary bodies to a variation in temperature, but if the body is compound they may consist in chemical effects, which we call electrolytic actions. These two phenomena, the Peltier effect and the phenomenon of electrolysis, must be considered as different manifestations of the same force; one or other of the actions takes place according as the body is simple or compound.

These laws, which are demonstrated to hold for solid and liquid bodies, must also be applied to gaseous bodies, where we must therefore expect electrolytic actions as well as chemical ones of a secondary nature.

Our authors then go on to discuss the spectra of carbon and their compounds. They begin again with a historical statement of the work done in this respect, and as this part of the paper does not contain anything new to those who are interested in the matter we pass to the question which they propose to solve: "How are we to explain all these different spectra of carbon compounds?" They draw attention to the fact that all these spectra have a common characteristic, as they consist of bands which can be resolved into fine lines. There is, however, one spectrum which must be attributed to carbon, while the authors attribute all other spectra to carbon compounds. This spectrum is a line spectrum. It is obtained from carbon poles by means of a powerful jar.¹

If we allow a spark to pass between carbon electrodes, the lines are not seen in the middle of the field, but only close to the poles similar to the metallic lines. If the discharge pass through some carbon compound, one obtains not only these carbon lines, but also those of oxygen, hydrogen, or nitrogen, that

¹ Abstract from a paper in the "Nova Acta Regiæ Societatis Scientiarum Upsaliensis," vol. ix., 1875, by A. J. Angström and T. R. Thalen.

¹ It is the spectrum marked by Watts No. IV.—A. S.